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Notice to readers: The name of this book will change from "USSR: Electronics & Electrical Engineering" to "Central Eurasia: Electronics & Electrical Engineering" as of 6 January 92.

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Digital Image Interpolation Methods for Photodetector Arrays With Quincunx Sampling

[Article by M. G. Vydrevich, Elektron Science Research Institute]

UDC 621.372.54.037.372

[Abstract] The advantages of quincunx sampling (ShD) over traditional orthogonal sampling methods, particularly the fact that it has only a half of its message redundancy and, as a result, makes it possible, in principle, to obtain the image of the same quality while transmitting only a half of its information stream and reduce the communication channel bandwidth or maintain the same bandwidth but increase the system's spatial or temporal resolution by twofold are discussed. The principles of reconstructing sampled images, the characteristics of quincunx sampling image reconstruction, the breakup of the interpolation procedure into two stages, the method of synthesizing the discrete interpolating filter, specific applications of the method to quincunx sampling, and experimental results are described. The approach to the task of image interpolation with quincunx sampling makes it possible to synthesize simple and efficient digital filters realized with minimal equipment outlays; the digital filter synthesis method is also suitable for a more general task of discrete filtering and may be used for solving a broad range of image processing problems. The author is grateful to B.N. Zhemerov and V.L. Rivkind for helping with experimental verification of the results. Figures 7; references 8.

'EL IT' Color Television Receiver With Digital Signal Processing

[Article by Yu. A. Medvedev, V. V. Movchan, Elektron Television Science Research Institute]

UDC 621.397.446:621.397.132

[Abstract] The transition from traditional analog video and audio signal processing methods to digital methods and the resulting reduction in outlays for production and warranty repairs due to the absence of trimmers and a high degree of automation are discussed. It is noted that the ITT Intermetal (FRG) company pioneered the production of digital chips (IMS) to class TTsI-2Ts TV receivers, particularly the Digit-200 chip which ensures digital processing of video and audio signals for various systems and standards. The EL IT color TV receiver developed at the Elektron Television Science Research Institute (NIITT) on the basis of five specialized Digit-200 family chips which makes it possible to receive SECAM and PAL system programs in the D, K, K1, B, C, and L standards, receive and display data in the Teletext system, and perform other functions is described. A block diagram of the EL IT TTsI-2Ts receiver and a photograph of the boards are cited. The functional units of the new TV set are described. Figures 2.

Review of Soviet Telecommunication System, Software, Peripheral, and Subscriber Unit Market for TV Information Networks (1990-1991)

[Article by A. P. Altayskiy]

UDC 621.397.743(47+57)

[Abstract] Continued from *Tekhnika kino i televideniya* Nos. 6 and 7, 1991. The issue of shifting the emphasis in operating TV information cable networks from TV broadcasting to providing paid services to subscribers is addressed in light of the absence of sufficient "watchable" TV programs and video productions capable of stimulating network development due to, on the one hand, obvious bankruptcy of most of the country's artistes and their inability to maintain viewer interest and on the other - legal, technical, and other difficulties of showing foreign video production and satellite TV programs (including the language barrier). A list of television, video, and information products and services being provided by various enterprises and production associations (items 94-337) is cited. It is noted that computer programs and hardware for their comprehensive use in telecommunication networks dominate this list. The journal's editorial board is continuing its work on a "who's who" directory; at present, weekly update bulletins are being published in response to reader requests.

Television Information Distribution via Fiber Optic Communication Lines

[Article by Z. P. Luneva, Moscow Television Science Research Institute]

[Abstract] The increasing use of fiber optic cables (VOK) in trunk and distribution networks for TV systems for various purposes instead of standard metallic conductor cables, making it possible to expand the data transmission volume and line utilization efficiency, increase the line length and noise immunity, improve performance, and save scarce and expensive nonferrous metals is discussed. The advantages of analog fiber optic communication lines (VOLS) for TV program distribution networks are outlined and ways of modulating the optical radiation intensity by the direct method, pulse-frequency signal, and frequency division multiplexing are summarized. Methods of equalizing the watt-ampere radiator characteristic nonlinearity and decreasing the effect of the fiber optic communication line element noise are described. Switching devices for connecting the video signals to any output in the switching field of application TV systems. Figures 3; references 6: 5 Russian, 1 Western.

What Days to Come Have in Store for Us?

[Article by Ye. Karnaukhov, S. Smirnova, Moscow]

[Abstract] Reports from the 35th All-Union Exhibit of Ham Radio Designer Items are summarized. The most recent exhibit is in danger of also being the last one: only 200 items were presented vs. 500 at the previous exhibit. In addition, most of the exhibited items were not original or new. Despite the fact that the exhibit was no longer sponsored by DOSAAF alone, it drew few new participants. Moreover, it was hardly all-union: only Russia, Uzbekistan, Ukraine, Moldova, and Belarus sent their representatives. The exhibit had two new sponsors - the All-Union Society of Innovators and Inventors (VOIR) and the Central Committee of the VLKSM - but they did not contribute financially; none of the 150 enterprises contacted directly by the ham club responded with an offer of funds. Prizes were given in the following eight categories: radio electronic equipment for competition and training purposes; equipment for SW and VHF hams; equipment for the national economy; computers; radio and TV recording and playback equipment and musical instruments; instrumentation; consumer electronics; and young ham designs. Poor equipment specifications are emphasized. The authors ask the Committees on Science, Public Education, and Culture and Transportation, Communications, and Informatics at the USSR Supreme Council to treat the article as an official report on the state of affairs in the field of amateur radio. Figures 4.

Photomechanical Transducer

[Article by Ye. Sukhoverkhov (UA3AJT), USSR Central Ham Radio Club, Moscow]

[Abstract] The photomechanical method of producing a television image with a slow scan - the most accessible to ham operators - whereby the optical image is converted into an electric signal complemented with horizontal and vertical sync pulses is outlined. The resulting picture quality may be as good as that obtained by a vidicon-based SSTV camera. The photomechanical transducer used for line-by-line data readout consists of a phototransistor, a drum, an illuminating lamp, and a lens. The operating principle of the device and its components is described. The photomechanical transducer's drawback is its relatively low response speed and its advantage is the possibility of using it together with a VCR or even computer. The feasibility of increasing its resolution from 128 lines per frame to 256 is discussed. Figures 2; references 1.

Telegraph Key With ROM

[Article by A. Romanchuk, Novikovo, Sakhalin oblast]

[Abstract] The design of a new telegraph key with random-access memory (OZU) on two chips is outlined. When the Morse key is closed in the "dot" or "dash" position, a corresponding binary code is generated and helps to select one (dot) or both (dash) RAM chips. The pulses from which the marks and spaces are formed are used only for controlling the key operation. The design is also characterized in that there is no need to record the unit space with a duration of one dot at the end of the dot or dash in the character; it is formed automatically, which makes it possible to use the memory volume more efficiently and use the proposed key not only for operating on the air but also for recording and reading training texts. The operating principle of the new Morse key with ROM and its circuit diagram are described. In the wait state, the key has a low power demand 30 µA given a 9 V power supply, making it possible to use the recorded information more than once. Figures 2; references 5.

Automatic Electronic and Radio Equipment Operation Shutoff Switch

[Article by A. Kozyavin, Voronezh]

[Abstract] The device generates a warning audio signal at specified time intervals and then disconnects the power supply from various types of electric and radio electronic equipment, such as TV sets, radios, tape players, irons, heaters, etc. The use of the timer switch not only saves electric power but also increases the operating safety of electronic and radio equipment which is often left unattended; this is especially true for TV sets which are often left on at the end of the broadcast. The switch represents a time delay relay with a long time lag; its operating principle is described and its circuit diagram is cited. If assembled correctly, the timer does not call for any adjustments; its time lag can be set within a range from 15 minutes to three hours. Since all of the timer's devices, including its common wire, are at a power supply voltage, this wire should neither be connected to the frame no grounded; in addition, the design must meet the requirements imposed on direct power supply devices (without a transformer). Figures 1; references 1.

New Character Generator for 'Radio-86RK'

[Article by Yu. Ignatyev, Moscow]

[Abstract] Continued from *Radio* No. 7, 1991. Several methods of displaying the character generator on screen are described. The need to expand the set of characters displayed by the screen driver, as "Radio-86RK" software is being constantly improved, is identified. In particular, the need to add the letters of Cyrillic alphabet for word

processing and text editor applications is emphasized. The constraints of expanding the character set to include both lower case and capital Cyrillic letters are outlined from the' viewpoint of ensuring compatibility with the Radio-86RK microcomputers. The specific steps involved in creating the bitmaps for new character displays and editing the corresponding hexadecimal action tables are summarized. The use of erasable programmable ROM with an ultraviolet PROM burner for storing the new character set in the computer memory is described. Figures 3; tables 4.

PENX Graphics Editor 'Orion-128' Ham Microcomputer

[Article by V. Safronov, V. Sugonyako, Moscow oblast]

[Abstract] The PENX graphics editor which makes it possible to develop monochrome and sixteen-color graphics images, store them as a standard files library, and edit them is described and its uses for developing various types of tables, charts, and figures for subsequent printing and graphic fragments or sprites for all types of application and game software and for developing dynamic advertising and educational clips and stills are outlined. The PENX graphics editor is intended for operating with the ORDOS operating system with a minimum RAM (OZU) volume of 128K. The specific steps involved in program

installation and startup and operations in the figure, window, grid, keyboard, and line mode are summarized. Editor functions ar illustrated by drawing a circle and an arc. The methods of executing the coordinates and automatic recording functions and toggling to and from color and monochrome operation are described. Tables 2.

'Elektronika M-402S' Tape Recorder

[Article by V. Shachnev, Zelenograd]

[Abstract] The Elektronika M-402S portable stereophonic commercial mini tape recorder intended for recording talk shows and music programs on a MEK I tape in an MK-60 cassette and playing back recordings on MEK I, MEK II, and MEK IV tape is described. The new tape recorder has the automatic shutoff and pause functions, a power supply light indicator, a tape type selector, and an automatic stereo to mono switch. The Elektronika M-402S has mechanical and electric sections. The principal tape recorder specifications are summarized and its circuit diagram is cited. The amplifier operation in the playback mode is described in detail. The Elektronika M-402S can be used with an A343 Prima power supply source of plugged into the mains. The tape transport (LPM) mechanism employs a single motor. All LPM parts are mounted on a single base. Figures 2; tables 2.

On Effective Current Sheet Conductivity in Magnetosphere Tail

[Article by P. F. Krymskiy, Space Physics Research and Aeronomy Institute at the Yakut Branch of the Siberian Section of the USSR Academy of Sciences]

UDC 550.383

[Abstract] The current in the magnetosphere's tail plasma layer in a collisionless approximation is diamagnetic in origin and is determined by the thermal pressure distribution. Plasma layer turbulence is measured and the measurement results are used to estimate the abnormal current sheet conduction with the help classical formulas with an effective scattering frequency. The Hall current generated by the "dawn-dusk" field becomes polarized and creates a transverse electric field which, as projected upon the ionosphere, is aimed toward the equator. There are two effective transverse conduction components along the electric field: Cowling and Pedersen. The dawn to dusk conduction current in the plasma layer is determined by Cowling's effective conduction; Pedersen's conduction determines the redistribution of potential in the magnetosphere and ionosphere while Cowling's conductivity enhances the conduction current in the plasma layer and is greater than Pedersen's conduction by four orders of magnitude. References 23: 15 Russian, 8 Western.

Analysis of *Pc*1 Geomagnetic Pulsation Wave Packet Spectra Recorded Synchronously on Satellite and Ground

[Article by K. Prikner, D. S. Fligel, Geography Institute at the Czech and Slovak Federal Academy of Sciences, Prague, and Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation Institute at the USSR Academy of Sciences]

UDC 550.385.37

[Abstract] Simultaneous observations of $Pc1$ wave packets on the ground and on satellites (ISZ) make it possible to estimate the dispersion and attenuation of very low frequency waves in the circumterrestrial plasma and thus to diagnose it. Experimental data obtained by French researchers and provided to the authors in a digitized form are analyzed. An analysis of the spectra of eight wave packets of $Pc1$ geomagnetic pulsations at a close to 0.5 Hz frequency recorded synchronously by the Geos-1 satellite and in Iceland (64.4°N, 20°W) demonstrates that spectra on the ground are broader at the center than those on the satellite; the base spectrum frequency on the ground is higher than on the satellite and the difference varies within 0.013-0.093 Hz with a 0.046 Hz mean. The H_x component propagates in the magnetospheric-ionospheric plasma with the least attenuation (by 20 times); the H_y and H_z components are dampened by 100 and 50 times, respectively. Calculations of the magnetospheric-ionospheric plasma

transmittance are rather consistent with the measurement results. The authors are grateful to Dr. S. Perrault (France) and D.R. Shklyar (Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation Institute at the USSR Academy of Sciences (IZMIRAN)) for discussing the results and A.V. Astakhova, A.G. Bogdanova, and O.N. Belyayeva for help with processing the measurement results and preparing the manuscript. Figures 4; tables 2; references: 6 Western.

Using VLF Transmitter Signals to Diagnose Ionospheric Turbulence

[Article by A. M. Perlikov, Ye. Ye. Titova, V. Yu. Trakhtengerts, Polar Geophysics Institute at the Kola Scientific Center of the USSR Academy of Sciences]

UDC 550.388.2

[Abstract] Small-scale ionospheric turbulence substantially affects the propagation of very low frequency (ONCh) whistler waves and transforms them into low-frequency plasma waves; since the latter's wavelength is much shorter than the former's, considerable VLF signal spectrum broadening is observed due to the Doppler effect. The resulting broadened signals (US) represent a superposition of plasma waves formed scattered whistler VLF signal at various altitudes in the turbulence regions which have reached the satellite. The relationship between the broadened signal characteristics and scattering area parameters is considered. The physical premises of using the broadened signals from VLF transmitters for determining the dimensions, position, and internal structure of the regions of small-scale ionospheric turbulence are analyzed; an investigation of the transient phenomena at the start of the broadened signal pulse made it possible to determine the altitude range of the turbulence region as 10^2-10^3 km. The time modulation of broadened signals may be used to determine the spatial modulation of ionospheric turbulence. The transverse turbulence region modulation scale can be determined on the basis of time characteristics of broadened signals, provided that this scale exceeds 10 km. Figures 4; references 4: 1 Russian; 3 Western.

Study of Lower Ionosphere Using Artificial Periodic Irregularities

[Article by L. N. Rubtsov, A. V. Blokhin, V. Ya. Kovalev, S. F. Marchenko, V. V. Belikovich, Ye. A. Benediktov, N. P. Goncharov, A. I. Yezhov, A. V. Tolmacheva, Radiophysics Scientific Research Institute, Gorkiy]

UDC 550.388.2

[Abstract] Detection of backscattered radio signals from artificial and natural electron concentration irregularities makes it possible to determine a number of atmosphere and lower ionosphere parameters; the method of resonance radio wave scattering by artificial

periodic irregularities created by the field of a strong standing radio wave is the most informative for the task of remote sensing of the middle atmosphere. A diagnostic unit for investigating the lower ionosphere by this method was developed near Dushanbe. The unit consists of a Gissar heater which, in turn, consists of a 100 kW transmitter and an antenna system with a 60-90 directive gain. Several cycles of measuring the relaxation time of artificial periodic irregularities were conducted at 38°N in the fall of 1988 and winter and spring of 1989. The altitude relaxation time profile in a 60-120 km range is measured. Seasonal relaxation time variations are identified at 90-110 altitudes whereby vernal values exceed the hibernal figures. Brief relaxation time variations with a 5-15 m period probably caused by the excitation of acoustogravitational waves near the terminator are recorded at 80-95 km altitudes. Figures 3; references 4.

High-Voltage Insulation Diagnostics Using Multichannel Analyzers

[Article by B. G. Naboka, A. V. Besprozvannykh, V. Ya. Gladchenko]

UDC 621.319.4:537.529.001.24

[Abstract] Characteristics of partial discharge (ChR) impulses, such as the apparent charge, frequency, mean current, etc., are analyzed for the purpose of diagnosing the state of solid high-voltage insulation with the help of digital computers (ETsVM). Several methods of increasing the robustness of characteristic partial discharge processing data are examined: optimal smoothing of the experimental relations by digital filtering and fast Fourier transform; using universal regularized programs for numerical solution of the integral equations; and treating the differential distribution function as an integral function. The methods of improving the reproducibility of diagnostic results are outlined: storing amplitude partial discharge pulse spectrum data in a multichannel analyzer memory for a sufficient time; and using testing voltages within a limited range. An algorithm for analyzing partial discharge characteristics and a program in the FORTRAN language are developed. It is shown that processing of differential amplitude spectra of partial discharge pulses on a digital computer makes it possible to obtain principally new data on the state of insulation not attainable by direct measurements; algorithms based on analytic solutions of Volterra's integral equation can be easily realized on a microcomputer and are robust given an initial data variation of 10-40 percent. Figures 6; tables 1; references 6: 5 Russian, 1 Western.

Interaction of Electric and Thermal Fields in Metallic Conductor at High Current Density

[Article by L. S. Gerasimov, V. I. Iskryannikov, Novosibirsk Electrical Engineering Institute]

UDC 621.372:537.52

[Abstract] Process dynamics of the interaction of thermal and electric fields is examined in the case of an initial inhomogeneity whose dimension is assumed to be substantially smaller than the characteristic dimension of the conductor. To this end, an infinite metallic conductor placed in an external electric field which induces current in it is considered. The existence of two thermal and electric field interaction conditions in a metallic conductor with a current is established and the diagnostic variable is identified. It is shown that given a certain critical current density, any inhomogeneity in the conductor becomes a center around which overheating develops; this critical current density which causes an accelerated temperature rise and conductivity drop inside and around the inhomogeneity is a function of the conducting medium's thermal parameters and inhomogeneity dimensions. As the current density increases, the overheating instability development time shortens; the shape of this inhomogeneity is transformed under the effect of a high-density current. Figures 2; references 12: 11 Russian, 1 Western.

Characteristics of Radar Signal Detection Through Stable Noise

[Article by O. N. Maslov]

UDC 621.37:621.391

[Abstract] Robust distribution is a direct extension of the normal law, so noise simulation using robust distributions makes it possible fully to utilize the fundamental character of the central limit theorem of the theory of probability while investigating the signal processing algorithm robustness without additional nonlinear transformations related to the nonGaussian noise generation. The results of an analysis of the detection probability of radar signals against the background of robustly distributed noise are presented. The characteristic function notation of robust distribution is used to describe the noise. Detection characteristics were calculated using the Neumann-Pearson criterion for an optimal detector. Both unidimensional and two-dimensional noise models are considered and the efficiency of doubled vs. single detection is estimated. The specific distinctions between stable and normal noise are analyzed. The use of the above two noise models makes it possible to analyze the robustness of the signal processing algorithms under the effect jamming and unpremeditated interference by varying the numerical values of the characteristic exponent and correlation. Figures 4; references 6.

Formation of Phased Antenna Array Radiation Pattern Sector Downfall During Wide-Band Noise Suppression

[Article by V. I. Gusevskiy]

UDC 621.396.67.01

[Abstract] The principles of adaptive space-time and space-frequency discrimination and processing algorithms on the basis of searching for the optimal complex vector of weight coefficients (VVK) are summarized and the constraints imposed on the amplitude-phase distribution (AFR) of the field in the phased array (FAR) aperture which ensure minimal radiation pattern (DN) distortions in the far-field region are found. A known linear relationship between the noise spectrum width and the radiation pattern sector downfall in a linear equally spaced array is extended to the case of linear and planar phased arrays with an arbitrary amplitude-phase distribution and a random aperture boundary. The nonlinear aperture phase distribution law necessary for shaping a sector downfall is

synthesized using the method of orthogonal aperture polynomials (AOP) and is optimal by the criterion of minimal gain (KU) loss during noise suppression. A linear phased array under the effect of noise with an approximately 10 percent spectrum width arriving from various angular directions is numerically simulated. Optimal phase distribution harmonics correspond to partial equalizing radiation patterns in the far-field region described by spherical Bessel functions or their linear combinations whose maxima are oriented in the directions close to the noise arrival directions. Figures 4; references 6.

Analysis of Radio Signal Characteristics on Single-Mode Fiber Channel Output With Interferential Photodetection

[Article by A. N. Bratchikov, I. P. Glukhov]

UDC 621.395.677.3

[Abstract] One of the most promising concepts of new-generation antenna array (AR) design - replacing traditional coaxial waveguide microwave (SVCh) and EHF (KVCh) signal distribution systems with their fiber optic analogues - is examined and a general approach to analyzing the spectral response of radio signals on the output of single-mode fiber optic channels is described. To this end, excitation of a single mode optical fiber (OV) by linearly polarized radiation of a two-frequency laser source is examined. A theoretical model of an optical channel distributing microwave and EHF signals among active array modules made from a single-mode fiber using interferential photodetection is analyzed. The model takes into account the effect of the single-mode fiber material, waveguide, and polarization dispersion with standard longitudinal irregularity statistics, statistical properties of injection laser radiation determined by the Gaussian random phase fluctuation process, and statistical properties of radio signals used for coherent laser modulation and locking. Phenomena related to the fiber material polarization and double refraction have an identical effect on all spectral components and have no effect on the signal/noise ratio (OSSh) in a first approximation. The radio signal spectrum and signal/noise ratio on the channel output are calculated. Figures 4; references 6: 3 Russian, 3 Western.

Radiation of Electromagnetic Waves by Cylindrical Ring Antennas

[Article by F. F. Dubrovka, V. S. Pantov]

UDC 621.396.677.75

[Abstract] The properties of waveguide cylindrical ring structures used as emitters capable of shaping directional axial radiation of electromagnetic waves and their advantages - small transverse dimensions, adaptability to streamlined manufacturing, ability to radiate electromagnetic waves with an arbitrary polarization state, and potentially low cross-polarized radiation level - are addressed. The results of theoretical and experimental studies of the distribution and radiation characteristics of cylindrical ring antennas are presented. The inner and outer boundary value problems of electrodynamics are solved with the help of the variational method of partial domains and the Fourier transform method, respectively. The adequacy of the theoretical model to the real entity is corroborated by the results of experimental research. Thus, the mathematical model and software produce reliable results and may be used for analyzing and synthesizing cylindrical ring antennas. Figures 4; tables 1; references 5: 3 Russian, 2 Western.

Selection of Discrete Fourier Transform Order for Superresolution Direction-Finding of Wide-Band Sources

[Article by E. A. Maltsev]

UDC 621.396.96

[Abstract] Known methods of superresolution direction-finding of wide-band sources in the frequency domain are addressed and the minimum discrete Fourier transform (DPF) order whereby the signal bandwidth in processing channels does not significantly affect the accuracy of source bearing estimation is evaluated. A criterion is proposed whereby the discrete Fourier transform order must ensure that the bearing ambiguity interval of the wide-band source is smaller than the permissible standard deviation of the estimates. Here the ambiguity interval is selected equal to one-half of the signal spectrum width in one discrete Fourier transform channel. Spatial spectra for correct and incorrect discrete Fourier transform order selection are cited for illustration in the case of three independent signal sources. The results of the experiments attest to the efficacy of the proposed criterion of determining the discrete Fourier transform order. Figures 1; references 4: 1 Russian, 3 Western.

Polarization State Analyzer for Superwide-Band Signals

[Article by V. A. Sarychev, M. N. Popov]

UDC 621.396.96.001.2

[Abstract] Analysis of fully polarized signals in conventional "narrow band" polarimetry by means of finding the complex amplitude components for a certain basis formed by orthonormalized and generally nonorthogonal complex vectors is discussed. For superwide-band signals, the polarization structure is represented on the basis of interpreting the imaginary unit j as a $\pi/2$ rotation operator in space.

The superwide-band signal all of whose spectral components are right- or left-hand circularly polarized is denoted through the linear polarization wave determining the temporal and spatial structure of the signal and the temporal operator of the Gilbert transform. Relationships are derived which make it possible to justify the procedures of analyzing the polarization structure of superwide-band signals. A block diagram of the device measuring the polarization parameters on the basis of the resulting relationships is presented. It consists of an antenna, a polarization separated, a convolution device, and a divider. Figures 1; references 3.

On Inverse Problem Solution Accuracy of Earth Troposphere Radar Sounding

[Article by V. A. Andrianov, V. M. Smirnov]

UDC 621.396.96:551.510.52

[Abstract] The formulation of the inverse problem of radar sounding of the Earth's troposphere - determining the altitude profile of the refractive index from radar measurements over an oblique incidence path from a ground station to the satellite (ISZ) - is flawed, so the problem of determining the information content value of measurements from the viewpoint of reconstructing the altitude profile of the troposphere's refractive index is formulated. The effect of the initial measured data error of the satellite's radial velocity on the reconstruction accuracy of the troposphere's refractive index is analyzed on the basis of numerical simulation of the radio wave propagation conditions over the ground station-satellite path. An analysis demonstrates that the radial satellite velocity measurements have a real information value if their accuracy is better than 0.1 cm/s; that the altitude profile of the troposphere's refractive index at a point with this altitude is accurate within 2 N-units; and that the use of the refractive index profile thus reconstructed makes it possible to determine refraction corrections for radial velocity measurements accurate within 0.25 cm/s or better. Figures 4; references 8.

Wave Diffraction on Imperfectly Conducting Echelette

[Article by S. A. Masalov, A. V. Ryzhak, V. M. Shkil]

UDC 621.372.8

[Abstract] The problem of wave diffraction on an echelette with a finite conductivity of its faces is considered and the effect of impedance of various origins on the echelette properties is investigated. The method used for this purpose is based on a strict theory and makes it possible, if impedance-type boundary conditions are set, to reduce the problem under study to an infinite system of Fredholm's second-kind linear algebraic equations. The solution of the problem is found on the basis of the semi-inversion method with the help of Leontovich's impedance boundary conditions for an E-polarized wave. An analysis demonstrates that as the wavelength shortens, absorption increases. The qualitative and quantitative dependence of the absorption level is consistent with the skin effect theory. It is noted that the above method may be extended without significant modifications to the case of an H-polarized wave and is promising for solving the problem of diffraction on a grating with various dielectric inclusions. Figures 5; references 9: 8 Russian, 1 Western.

Optimal Instrumentation Arrangement in Multistatic Electronic Systems With Stochastic Observation Channel Structure

[Article by V. V. Khutortsev]

UDC 621.396.67.01

[Abstract] The issue of optimal instrumentation (IS) arrangement design in multistatic electronic systems (MRS) is addressed in light of a situation where the probability of normal instrumentation performance in the multistatic electronic system is less than unity and varies depending on the observation conditions and time. Consequently, the urgent issue of developing a method of optimizing the instrumentation arrangement design allowing for the stochastic structure of observation channels is considered. The optimal design problem is solved on the basis of the invariant group approach whereby the stochastic channel structure is described by discrete Markov processes with two states. To this end, a multistatic radio electronic system consisting of a central processing station (TsPO) and M observation points each housing an instrument measuring one or several target (ON) parameters, e.g., range, angular position, or velocity, is considered. An analysis shows that a decrease or increase in the instruments' performance probability decreases or increases their total operation time over the observation interval. The results may be extended to discrete instruments. Figures 4; references 9.

Observation of Ion Emission and Instability Induced by Current in Island Patch Metallic Film

[Article by V. V. Vladimirov, S. A. Gorban, S. A. Nepiyko]

UDC 537.534.2

[Abstract] The electron emission induced by electric current in an island patch metallic film, i.e., a two-dimensional ensemble of tunnel-coupled small metallic particles on a dielectric substrate under various conditions is considered. It is shown that given an injection of sufficiently high power to the island patch, the beam of

electrons emitted from it becomes inhomogeneous in its cross section, i.e., the electron beam current density in the radial direction becomes rather periodic. Moreover, a "fine structure" appears. An ion emission which normally occurs only in the case of a fusible substrate now appears in the fine structure condition. The study was carried out in island patch gold films prepared by thermal sputtering directly in a USU-4 metallic deep vacuum unit. The results demonstrate that given a high voltage (current) in the film, the emission spot corresponding to the image of an individual emission center becomes stratified into arcs which attest to the appearance of a nonuniform relief on the center surface. Such an inhomogeneity may be due to an instability developing on the emission center surface in a sufficiently strong electric field if the center converts to a liquid state. As the arc structure disappears, the current density in the island patch probably drops significantly; likewise, the ion concentration in plasma decreases sharply and the ion emission becomes difficult to record. Figures 4; references 14: 12 Russian; 2 Western.

Widening of Antiparaxial Expansion Domain in Intense Relativistic Beam Synthesis

[Article by L. P. Shanturin (deceased)]

UDC 537.391.01

[Abstract] The essence of the synthesis method on the basis of antiparaxial expansions is to analyze beams in the neighborhood of a curvilinear cathode under arbitrary emission conditions; yet the feasible domain of near-cathode asymptotics in the longitudinal direction is limited by the small expansion parameter which is postulated by the basic premises of the perturbation theory. The possibility of adding up antiparaxial expansions with the help of nonlinear transforms by transforming the original series into an auxiliary converging series is studied. The method of nonlinear transforms whose efficiency has been checked in standard problems is used to investigate the properties of antiparaxial expansions which describe perturbations in relativistic beams, particularly the transverse parameter nonuniformity, relativism, and intrinsic magnetic field, as well as to examine the features related to the complete space charge condition. The effect of the beam current on the convergence and calculation accuracy of antiparaxial expansions is ascertained. It is shown that the use of an expansion parameter equal to the logarithm of the distance to the cathode for accelerating the convergence is efficient in computing the scalar parameter but inefficient in calculating the relativistic velocity. Figures 8; tables 4; references 11: 10 Russian, 1 Western.

Features of Randomly Amplitude and Phase Modulated Picosecond Pulses Compressed in Optical Fiber

[Article by V. A. Aleshkevich, G. D. Kozhoridze, M. V. Shamonin]

UDC 681.7.068:535.3

[Abstract] The role of amplitude and phase fluctuations of the laser field as well as their interrelation during the nonlinear compression of high-power random pulses in optical fibers are discussed and the patterns of temporal self-compression of randomly amplitude and phase modulated (AM and FM) picosecond pulses in optical fibers under the joints effect of Kerr's cubic instantaneous nonlinearity and an abnormal quadratic group velocity variance are investigated by the nonlinear phase channel method. Emphasis is placed on examining the joint and several effect of light field's amplitude and phase fluctuations on the process of nonlinear compression. Expressions are derived for the maximum compression factor and optical optical fiber length. The shortest deterministic pulse duration attainable is estimated and it is demonstrated that optimal compression realization calls for data on the random pulse structure. Recommendations for selecting optimal parameters are given. It is noted that to this end, it is expedient to measure the mean duration and coherence time in a random cross section and then determine the pulse's temporal structure. Figures 5; references 18: 12 Russian, 6 Western.

Depth Probing Equations for Multiply Reflected Signals

[Article by V. S. Luchininov]

UDC 621.396.96.01

[Abstract] The new possibilities of probing the earth layers under the surface and observing echo signals which have undergone multiple reflections from layer interfaces and structural elements of the radar unit being opened up by improvements in depth probing hardware are discussed. Such signals are described in the framework of a uniform single-layer model, conventional beam interpretation, and monostatic location and ranging. It is shown that the model can be easily extended to a bistatic radar system and multicomponent media with curvilinear interfaces. Figures 2; references 4: 3 Russian; 1 Western.

Wide-Band Quadrature Radio Signal Splitters on Surface Acoustic Waves

[Article by V. A. Yermolov, K. V. Ivashkin, I. V. Moiseyev]

UDC 621.396.6

[Abstract] The drawback of surface acoustic wave-based quadrature radio signal splitters (KRR) which represent a delay line containing a piezoelectric acoustic guide with one input and two output interdigit transducers (VShP) on its working surface in parallel acoustic channels with a quarter-wave surface acoustic wave (PAV) spatial shift

ensuring the requisite phase ratios among the channels - the narrow transmission band - is outlined. The development and experimental investigation of a wide-band surface acoustic wave-based quadrature radio signal splitter executed on the basis of linear FM (LChM) interdigit transducers are described and its circuit diagram, performance curve, and operating principle are cited. An experimental KRR was made on a YZ lithium niobate substrate with a converter containing 50 electrodes and with a 4 mm acoustic aperture. This KRR's experimental curves demonstrate the feasibility of developing wide-band PAV-based KRR which make it possible to maintain a 90° phase shift accurate within +/-2° within a transmission band of up to 25 percent. Figures 2; references 5.

Calculation of Specific Energy Load of Steady-State Noise Signal

927K0077B Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 60-62

[Article by O. N. Maslova]

UDC 621.014.482

[Abstract] The effect of the electromagnetic field (EMP) of steady-state noise signal radiators is examined from the viewpoint of their environmental and biological safety. To this end, the energy load (EN) of electromagnetic signals on biological entities is analyzed in addition to standardizing the maximum permissible level (PDU) of the EMP's magnetic and electric components. A universal and electrodynamically strict energy load criterion which makes it possible to analyze the safety of the electromagnetic field effect for a broad range of real radio signals, including noise and noise-like, is considered. The analysis procedure on the basis of this criterion is consistent with the recommendations of existing regulatory documents. The methods of determining the specific energy load of a stationary noise signal with a uniformly bounded energy spectrum are illustrated by examples. The criterion is expressed in $(J/m^3)\cdot h$. References 6.

Determining Two-Dimensional Signal Shift Using Discrete Fourier Transform

927K0077C Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 62-64

[Article by Yu. Ye. Yedomskiy]

UDC 621.391

[Abstract] The two-dimensional signal's shift along the x, y axes is determined by finding the maximum of the cross-correlation function R which, in turn, is sought by either direct computations or by calculating the two-dimensional convolution with the help of fast Fourier transform (BPF) algorithms. To this end, the possibility of determining the sampling steps in the frequency domain is demonstrated. Expressions which make it possible to simplify the procedure of finding the two-dimensional signal shift in the presence of noise and reduce the calculations volume by using the two-dimensional convolution representation in the frequency domain are derived. The procedure is reduced to solving simple equations whose coefficients, in turn, can be calculated using a smaller number of operations than the inverse discrete Fourier transform (DPF). References 2.

Potential Estimation Accuracy of Video Pulse Repetition Period With Unknown Arrival Time

927K0077D Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 65-67

[Article by A. P. Trifonov, M. B. Bespalova]

UDC 621.391

[Abstract] The need to estimate the repetition period of video pulses of a random shape with an unknown arrival time in statistical radio engineering applications is identified. To this end, analytical expressions are derived for the potential estimation accuracy of the video pulse repetition time against the background of additive white noise. The limit of estimation accuracy in the presence of spurious parameters is found. It is established that ignorance of the arrival time of a pulse train with an arbitrary shape increases the effective repetition period estimate variance by fourfold. At the same time, ignorance of the relative pulse duration or of the single pulse duration does not reduce the potential repetition period estimation accuracy of symmetric video pulses. References 4.

Synthesis of Phase-Shift Keyed Signals With Requisite Autocorrelation Function Side Spike Level

927K0077E Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 68-70

[Article by Yu. V. Cheprukov, M. A. Sokolov]

UDC 621.396.6

[Abstract] Synthesis of phase-shift keyed signals (FMS) with a limited maximum autocorrelation function (AKF) spike level is addressed; an attempt is made to develop a procedure for synthesizing phase-shift keyed signals with a requisite autocorrelation function side spike level. The phase-shift keyed signal consists of N elements of equal duration with an initial phase of 0 or π. The phase-shift keyed signal with side autocorrelation function spikes is referred to as FMS-R or R-signals. A technique for synthesizing R-codes on the basis of an ordered analysis is suggested. The FMS-R synthesis and filtering may be performed with the help of surface acoustic wave-based programming devices or discrete transversal filters where the weight coefficients corresponding to the R-codes are defined by the programmer. The resulting synthesis method makes it possible to find N-element phase-shift keyed signals with a given autocorrelation function side spike level whole relative value of R/N is lower than that of the M-sequence of the same length by more than a given figure. Figures 1; tables 1; references 6.

Generation of Ultimately Powerful Short Electric Pulses

927K0077F Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 73-75

[Article by S. I. Ziyenko, V. V. Brytkov, M. V. Goncharov]

[Abstract] Formation of short pulses by discharging reservoir capacitors on the load resistor through a regenerative switch (RP) and the problem of generating short electric pulses with the help of devices having an S-shaped voltage-current characteristic (VAKh) are addressed. The possibility of producing ultimately powerful short pulses by an active wave system with partially distributed parameters with the help of devices with an S-shaped voltage-current characteristic is justified theoretically and experimentally. A wave system with KT603B avalanche transistors was used in the experiments. A comparison of theoretical and experimental data demonstrates their adequate qualitative and quantitative consistency and shows that the system is capable of generating close-to-triangular pulses. The analytical expressions derived are simple and make it possible to estimate the principal parameters of the generated pulses' amplitude and time characteristics. Figures 3; references 5.

Mutual Ambiguity Function of Linear or Linear-Derivative Phase Modulated Signals for Distance and Velocity Measuring Radio Engineering Systems

927K0077G Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 76-78

[Article by K. V. Gormakov, G. G. Moiseyeva, V. S. Speranskiy]

[Abstract] An attempt is made to produce a system of signals with small ambiguity function (FN) and mutual ambiguity function (VFN) spikes in order to resolve the ambiguity in distance measuring equipment and velocimeter systems for a large number of targets given a low period/duration ratio of the probing pulses. The possibility of using linear and linear-derived signal systems of a large volume for this purpose is examined. An analysis of the properties of said signals in the presence of Doppler effect demonstrates the possibility of using derivative signal systems constructed on the basis of Walsh functions on a limited scale and the expedience of using linear and linear-derived systems of signals generated with the help of composite sequences. The ambiguity function of the above signal systems was investigated within the entire range of the matched filter response. It is shown that if the requisite signal system volume is increased and Doppler shifts are arbitrary in the matched filter transmission band, it is expedient to use linear-derivative systems in which base sequences are composed of Walsh sequences. References 4.

Method of Examining Radiation Parameters of Self-Phasing Antennas for Coherent Communication With Moving Object

927K0077H Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 81-83

[Article by V. G. Yerikhov, D. Ye. Maslov]

[Abstract] Self-phased antennas for communication with spacecraft and satellites which make it possible to increase the signal/noise ratio, ensure a short signal lock-on time, and make it possible to establish simultaneous communication with several objects and the difficulties of phasing these antennas due to the Doppler effect are addressed. A method of designing such antennas is proposed. To this end, the instantaneous phase of the emitted and received electromagnetic field in the body axes and fixed-in-the-Earth coordinate systems of the emission source and receiving antenna, respectively, is considered. The method is based on the instantaneous phase's invariance relative to Laplace transforms with a transition from one coordinate system to the other. It is assumed that an object moving by a given law radiates a spherical wave whose instantaneous phase changes by a certain law. The proposed instantaneous phase method is based on the delayed potential formulae and makes it possible to derive simple relationships for analyzing the performance parameters and radiation characteristics of self-phased antennas for coherent communication with moving objects; it can also be used for estimating the parameters of multistatic antenna systems with various self-phasing methods. The method is used to calculate the requisite radiation frequency and phase of self-phasing antennas and estimate the signal coherence parameter. The structure of the signal field transmitted to the moving object is estimated qualitatively. Figures 1; tables 1; references 3.

Experimental Autocorrelation Function Measurement of Decameter Wave Signal Strength Received in Town

927K0077I Moscow RADIOTEKHNIKA in Russian No 5, May 91 pp 86-88

[Article by A. V. Korolenkov]

[Abstract] Decameter band (DKM) radio wave propagation under urban conditions are considered for various radio engineering applications, particularly for RF broadcasting. An attempt is made to estimate the spatial signal correlation interval in the azimuthal plane in order to estimate the angular distance between the azimuthal directions whereby the signal strength under urban conditions can be regarded as statistically independent. It is shown that the knowledge of this parameter may be used to estimate the law of signal strength distribution in the city and antenna radiation patterns (DN) in the city. An analysis of the experimental results demonstrates that depending on the urban development pattern, the interval of statistically independent realizations, i.e., the correlation interval, at the signal detection point in the city may vary within 3-21°. Figures 1; references 2.

Using IKM-120 Transmission System in Railroad Cable Trunks

[Article by V. K. Kotov, V. V. Shmytinskiy, A. Yu. Kazanskiy, Leningrad Railroad Engineers Institute and USSR Railroads Ministry]

UDC 656.254.153

[Abstract] A promising way of increasing the utilization efficiency of existing cable trunks by using the IKM-120 multichannel pulse-code modulation (IKM) digital transmission systems (TsSP) is considered. The IKM-120 systems help to solve the urgent task of raising the number and improving the quality of channels and lay the groundwork for developing a digital communications network slated to become a part of the country's integrated communications network. The experience accumulated by the USSR Telecommunications Ministry in upgrading cable trunks during the transition to the IKM-120 digital transmission systems and countering the effect of the so-called third circuits is summarized. It is shown that in general, the development of both trunk and railroad service with the help of the IKM-120 transmission systems calls for laying an individual trunk designed solely for the digital transmission system operation. The use of IKM-120 systems in existing cable trunks is justified when it is necessary to increase the cable trunk capacity is soon as possible on 200-250 km railroads. To ensure IKM-120 serviceability in operating cable trunks, it is necessary to carry out a range of administrative and technical measures aimed at improving the digital line circuits' noise immunity during their joint operation with interlocking and blocking and operational intercom systems in the same cable. This calls for setting up production of noise suppression cells and developing specifications for their integration into the interlocking and blocking and operational intercom communication systems. Figures 9.

Service Intercom Design in DISK-BKV-Ts System

[Article by Ye. Ye. Trestman, O. V. Lebedeva, Urals Branch of the Railroad Scientific Research Institute]

UDC 656.259.1:656.2

[Abstract] A system for automatically monitoring the operating condition of the rolling stock, the DISK-BKV-Ts, capable of operating in two conditions, off-line and centralized (using the DISK-Ts subsystem), is described. In the centralized operation mode, data on the monitored trains are sent from line posts to a central monitoring station over communication lines for processing and decision-making. Station operator must therefore have an intercom link with each line post for making on-line decisions on whether to stop the train in question or let it pass through, repair the necessary rolling stock units, or carry out preventive maintenance. The design principle of this service intercom link is presented and the specific features involved in setting up the

service over DISK-BKV-Ts system channels using of standard selective communication equipment, particularly the interrelation of communication channels, are addressed. A block diagram of the selective communication system with a 120 km communication line is cited. The system is characterized by its high immunity to speaking currents. The proposed design was checked at the Southern Urals and Sverdlovsk Railroads; the results make it possible to recommend the design for use in the railroad network. Figures 10.

Communication Equipment for Medium and Small Stations

[Article by B. V. Ryabkov, Southern Urals Railroad]

[Abstract] The public address and "quiet" simplex communication system for small and medium railroad stations developed on the basis of the public address yard system (PSGO) by G.V. Glyadentsev and implemented in 1989 at yard "A" of the Chelyabinsk-Glavnyy station is described. The equipment makes it possible to broadcast public address messages over four feeder lines using the MKPV or ZKV 4x1x1.2 cable as well as set up "quiet" communications with four groups of instrument columns (up to 20 in a group) at stations with direct and alternating current traction using the SBPB 4x1 unbalanced cable. The system also provides for on-line point-to-point communications between engineers by bypassing the operators. Equipment reliability is ensured by substituting almost all electromechanical relays with electronic switches as well as by using standby regulator and amplifier units. A block diagram of the system is presented and the specific steps involved in public address, quiet, and direct on-line communication are outlined; the power supply and output panel design is described. The radio control rack has 860x600x250 mm dimensions. Figures 2.

Mastering 'Prognoz' System

[Article by I. N. Titov, Northern Caucasian Railroad]

UDC 656.25-52.071.84:656.2

[Abstract] The Prognoz system and its equipment intended for collecting and transmitting data on the status of signaling, interlocking, and blocking devices (STsB) from railroad track sections to the nearest stations and from these stations to the shift engineer office are described. This equipment is being mastered at the Morozovskaya section of the Northern Caucasian Railroad. The Prognoz equipment is capable of monitoring 20 stations with the adjacent tracks; each stations receives data from 16 monitoring posts each of which transmits data on the status of 18 sensors which identify both the prefailure conditions and the failure of individual units. The data receiving equipment contains a logical processing unit (BLO) which identifies information about the status of various devices

and forwards it to the train dispatcher and station attendant. The design and operation of Prognoz system components is described and the layout of its connector assemblies is presented. Today, the Prognoz system is being implemented at other railroad sections. Figures 2.

Line Radio Channel 'Section Shift Engineer - Portable Radio Set Users'

[Article by L. P. Tretyakov, Western Siberian Railroad]

[Abstract] The shortcomings of the Electrical Mechanic Communications (SEM) system in the constantly changing work environment are addressed and the section chief engineer's need to have point-to-point communication with staff working at signaling, interlocking, and blocking (STsB) locations in the field is identified. Devices which make it possible to set up a wire radio channel between the section shift engineer and portable radio (NRS) users on the one hand and seven line stations over a 160-km-long track section on the other are described. The RN-12B portable radio stations equipped with a fixed antenna ensuring a 5-6 km coverage are used to link electricians and mechanics with the duty yard master (DSP). The line radio channel is set up using upgraded PTV-DM receivers, an electronic selection and ringoff device (EUPO NRS), and RN-12B radio sets. The procedures for seizing a communication channel and maintaining contact is summarized and block diagrams of relevant devices are presented. The types and rated characteristics of all circuit elements are summarized. Figures 3; tables 1; references 1.

General-Purpose Telephone Sets

[Article by L. V. Aleksandrov, USSR Railroads Ministry]

UDC 621.395.3:656.2

[Abstract] Three versions of VEF TA-D, VEF TA-12, and VEF TA-32 general purpose telephone sets manufactured by the Valsts elektrotechniska fabrika in Riga (VEF), with a rotary dial (TA-11432 or VEF TA-D), push-button (TA-11434), and push-button with programmed numbers and memory dialing (TA-11430 IN), are described. These are fourth-generation desktop telephones intended for use in automatic telephone exchange (ATS) subscriber loops with a 60 V power supply and capable of operating within a -10 to +45°C ambient temperature range at a relative humidity of up to 90 percent and atmospheric pressures of 86-106 kPa. Telephone set specifications are summarized, their principal block diagram is cited, and component types and rated characteristics are summarized. Testing procedures are outlined. Specific details of the VEF TA-12 telephone sets are planned for publication in the next issue of *Avtomatika, telemekhanika i svyaz*. Figures 1; tables 1.

Television, Radio Broadcasting, and Space Communications

[Article by S. V. Glubokov, Russian Federation Ministry of Communications, Moscow]

[Abstract] The state and development outlook of telecommunications in Russia are discussed. The television transmission distribution network in the Russian Federation encompasses 312 powerful TV stations equipped with 597 transmitters with a 5-50 kW radiating power and 6,500 repeaters with a power of 10-100 W and is supported by about 100,000 km of union-wide radio relay lines and 37,000 km of area-wide radio relay lines as well as a "Gorizont" constellation of eight spacecraft (KA) and an "Ekran" constellation of two spacecraft; the network broadcasts in five two-hour zones covering 97.9 percent of the population with one program, 93.9 percent with two, and 36.4 percent with three or more. The needs of the network in the coming years are identified and ways of meeting them are outlined. The radio broadcast network encompasses 1,050 transmitters - 230 in the long and medium wave bands, 20 in the short wave band, ad 760 in the FM band. Measures to increase the pace of commercial radio in the republic are discussed. The state and development outlook of the rediffusion system (PV) which encompasses 15,172 outlets is described. The need to switch scientific and research institutes and enterprises previously aimed at the defense industry in the development of satellite communications is identified. The outlays and revenues of the telecommunications industry in 1990 are summarized. Figures 5.

Local Telephone Communication

[Article by G. S. Voloboy, Russian Federation Ministry of Communications, Moscow]

[Abstract] The state and outlook for the local telephone communication network development in the Russian Federation is summarized. Today, the network's telephone exchange capacity is close to 17.5 million numbers which includes 3.5 million numbers in rural areas; thus the total telephone density in the Russian Federation is a mere 13.17 per hundred people, i.e., 15.15/100 in urban networks and 8.1/100 in rural networks - placing Russia at the number seven spot among the republics. The inadequate telephone service, especially in the country, is discussed; some rural clinics and OB/GYN centers, e.g., still do not have telephones. The need to put in service 13.2 million numbers (11.0 urban and 2.2 rural) is identified. Other measures necessary for upgrading local telephone communication are outlined; they will include the introduction of electronic technologies, repeater stations with IKM-120 PCM equipment, and digital radio telephone facilities. The problem of financing the local telephone communication development is discussed.

Long-Distance Telephone Communication

[Article by M. V. Karmolina, Russian Federation Ministry of Communications, Moscow]

[Abstract] Successes in putting into service new automatic long-distance telephone exchanges (AMTS), increasing the number of long-distance pay phones, and expanding the direct dial services are summarized and problem areas in the field of long-distance telephone communication are outlined, primarily the low technical level of equipment, obsolete line and cable plant, failure to meet the goal of putting in service new automatic long-distance telephone exchanges and increasing the extent of long-distance channels both in 1990 and the 12th five-year plan. The causes of these drawbacks are identified: putting on hold construction of new automatic long-distance telephone exchanges due to the shortages of cable, unfitness of buildings, software flaws, shortages of multichannel and area-wide telecommunication equipment, the failure of vendors to supply cable under existing contracts, and shortages of foreign exchange for purchasing foreign automatic long-distance telephone exchange equipment. Plans for the development of long-distance communication and automating existing facilities are described.

Telegraph Communication

[Article by V. I. Prilipko, Russian Federation Ministry of Communications, Moscow]

[Abstract] The state of telegraph communication in the Russian Federation is discussed; today, about 1.2 billion telegrams are transmitted annually in the public telegraph network (OP), placing Russia first among the republics. Message switching (KS) systems are being introduced in the network in order to decrease the volume of manual operations and improve the quality of service; to this end, 62 electronic telegraph concentrators with message switching (ETK-KS) have been shipped to republic's enterprises; of these, 18 have been put into service. Three of the four telegraph service performance indicators have improved since 1989. The newspaper transmission network using facsimile telegraph is expanding; of the 34 newspaper reception centers in the republic, 18 operate over satellite communication channels. It is noted that the telematics and data transmission services in the republic lag behind most foreign countries despite the fact that the need in such service is continuing to increase; shortages of fax machines hold back wide implementation of the Telefax, Bureaufax, Teletex, and Videotex services. The need for a union-wide data transmission network is identified and measures for improving telegraph communication are outlined.

Rural Radio Communication: Wired vs. Wireless

[Article by A. S. Orlov, Kuybyshev Communications Directorate]

[Abstract] The advantages shortcomings of wired and wireless radio in rural areas are discussed and the experience of wireless radio in sparsely populated rural areas of Belorussia using low-power metric band (VHF) FM broadcast transmitters (ChM) is summarized. Such wireless radio requires a low-power TV repeater (RTS) or microwave link repeater or terminal station in the rayon center in order to mount the VHF equipment and transmitting antenna. To this end, a 100 W transmitter providing reliable coverage to a rayon and capable of transmitting two or four programs used; the users need special sets capable of receiving four programs with a built-in power supply. Wireless broadcasts can be transmitted in the existing FM band as well as in the 66-73 and 104-108 MHz band which are not currently used in the country. The need to obtain radio frequency permits for wireless broadcasts is identified and certain advantages of wireless radio over the wired three-program service, e.g., higher fidelity, the possibility of broadcasting in stereo, etc., are summarized.

Heat Insulation of Communications Facilities in Far North

[Article by N. N. Kozhevnikov, Yakut State University]

[Abstract] The advantages of foamed plastic - composite materials consisting of a polymer matrix filled with gaseous, liquid, or solid fillers - over such traditional heat insulating materials as mineral wool, expanded clay aggregate gravel, and construction industry waste, i.e., lower shipping costs, easy assembly, lower thermal diffusivity (0.03-0.04 W/m.K), a good adhesion to virtually all building materials, and a monolithic closed-cell structure, are demonstrated. The results of experiments to estimate the relative advantages of foamed plastics in "Kislovodsk"-type structures and prefabricated aluminum panel houses made by the Taldom plant and used for communications facilities in Yakutia are presented. The PPU-18N foamed polyurethane and Riport-6TN, a similar foamed plastic, were used for heat-insulating the roofs. The results show that compared to traditional materials, foamed plastic insulated roofs increase their thermal resistance by an average of 35-40 percent. The studies also demonstrated that foamed plastics are efficient in heat-insulating the cable sleeve boxes. The technique for insulating underground cable junction boxes is described.

'Orbita' One Year Later: Assessment

[Article by G. Zadonskaya]

[Abstract] The first year in the operation of the "Orbita" commercial bank is assessed on the basis of the annual report to shareholders mandated by both the union and republican law. The bank's activity is aimed primarily at developing communication facilities and services and creating a communication infrastructure. Today the bank's lending resources amount to 1 billion rubles and are being constantly replenished according to the chairman of the board F.M. Klimov. The bank is charging shareholders a variable rate of interest of 2-12 percent, depending on the source of funds, but a fixed rate of 7.6 percent was used in all other transactions. Most of the resources are channeled into upgrading communications facilities (32.1 percent), providing financial assistance (21.1 percent), implementing new equipment (11.3 percent), and supporting R&D work (9.3 percent). It is expected that the interest paid to depositors and charged to borrowers will increase due to the inflationary pressure in the economy. Orbita's profits in 1990 amounted to 10.621 million rubles while its assets stood at 805.038 million. The bank now has a branch in Kaluga and is in the process of opening branch offices in Omsk, Sevastopol, Ryazan, and Tambov. Tables 3

New Modern Equipment Complex for Cable TV

[Article by A. V. Kosarev, P. Yu. Komarov, ORPS]

[Abstract] Series 300 cable television system - a new generation of radiotelevision equipment developed on the basis of integrated circuit and microprocessor technologies which includes specially designed components - is described. Series 300 system consists of an antenna amplifier, a head station, a TV modulator, line amplifiers, couplers and branching taps, remote power supply, diagnostic and monitoring equipment, and coder/decoder systems for setting up pay TV channels. The system is intended for receiving and amplifying bands I-V TV signals from satellites and transmitting them to users over a coaxial cable. The design and functioning of system 300 elements is described. Modulator specifications fully meet GOST 20532-83 requirements. Users can also access various databases for exchanging digital data as well as various extensive alarm and emergency services systems. Commercial production of series 300 cable TV equipment is expected to begin in 1992 at the Gorizont Production Association. Figures 1; tables 9.

Wage Calculation Allowing for Compensation

[Article by I. K. Volkova, USSR Ministry of Labor]

[Abstract] The USSR Cabinet of Ministers issued decree
No. 105 on 19 March 1991 to pay a monthly compensation
of 60 rubles in order to provide a minimum safety net to
the population due to the reforms in retail pricing. The
amount of this compensation may be increased by contri-
butions from the communication enterprises' own
resources. The procedure for calculating the specific
amount of compensation for workers in the communica-
tion industry is described for a six-day, seven hour a day
work week. The procedure is illustrated by an example of
computing the hourly rate of levels 1-6 telecommunication
craftsmen involved in repairs and adjustment of basic
production equipment. Tables 1.

Ecologically Clean Thermal Power Plant: One Principal Trend in 'Ecologically Clean Power Industry' State Science and Engineering Program

[Article by V. V. Gapeyev, State Committee on Science and Engineering]

UDC 621.31:577.47

[Abstract] The need to increase the installed capacity of thermal power plants by almost 100 million kW in order to ensure stable power supply for the country's national economy and population in the next 20 years is identified. By the end of this century, the proportion of such power plants in the total electric power generation will amount to 70-80 percent. It is recognized that power plants in the USSR lag far behind their foreign counterparts with respect to protecting the environment. Twelve finalists in a completion for developing the concept of ecologically clean thermal electric power plants (out of a total of 140) selected by the Scientific Council of the State Committee on Science and Engineering in the framework of the "Ecologically Clean Power Industry" State Science and Engineering Program are summarized. State exhaust standards for boiler plants with a power of over 100 MW at new solid-fueled power plants in the USSR are compared to those of Germany, Japan, and the United States. Fund allocations and other steps toward implementing the program, e.g., upgrading and retrofitting existing power plants, are outlined and new designs and nontraditional technologies for burning various types of coal are considered. Phase 2 of the competition is scheduled for April-May 1991. Tables 1.

Problems With Methods of Economic Control of Science and New Technology in Power Engineering

[Article by V. S. Serkov, USSR Energy Ministry]

UDC 621.31.003

[Abstract] The principal trends in scientific and engineering progress in electric power engineering are identified as developing and implementing new technologies and equipment for efficiently utilizing fuel and energy resources, economically transmitting electric power and heat to users with minimal losses, ensuring the safety and reliability of the power industry and its installations, protecting the environment, efficiently maintaining and repairing basic equipment, and automating process control systems within the USSR Consolidated Power System (YeES), integrated power grids, and lower-level power networks. To this end, the principal problem of controlling scientific and engineering progress in the electric power industry is defined as creating the conditions for overcoming the negative processes plaguing the industry and raising the technical level of the industry to world level as well as planning the process of progress itself by concentrating the potential and resources in priority development trends. The steps necessary for implementing the program of ecologically clean power industry and nontraditional power sources are outlined. Emphasis is placed on enhancing the role of budget financing, adopting more democratic management mechanisms, introducing meaningful tax deductions, implementing advanced taxation methods, and ensuring the social safety net for industry workers. The need for central economic bodies to take into account the specific features of scientific activity is identified.

Retrospective Analysis of Power Pool Operating Condition Optimality

[Article by V. A. Bogdanov, S. V. Shulzhenko, Central Operations Directorate of the USSR Consolidated Power System and Moscow Energy Institute]

UDC 621.311.016:681.5

[Abstract] Two criteria of determining optimal conditions of parallel operating power systems and the USSR Consolidated Power System (YeES), are considered: minimal total fuel outlays for generating, transmitting, and distributing the necessary quantity of electric power of requisite quality for the totality of parallel operating power systems and minimal total costs of generating, transmitting, and distributing the necessary quantity of electric power of requisite quality. The latter criterion is used when the price of fuel reflects actual expenditures for its extraction and delivery. A complex of programs for optimizing operating conditions is summarized. It is shown that statistical probability methods combined with available data may be used to determine the functions of specific equivalent fuel outlays for each type of generating unit groups and that the specific fuel consumption functions may be used for retrospectively estimating the efficiency of operating conditions and evaluating the possibility of generating unit group load redistribution. The values of the average daily specific consumption of equivalent fuel on three typical days (Tuesday, Saturday, and Sunday) and the increment or decrement of the hourly thermal power plant output relative to the optimal load are cited for illustration. The results demonstrate that the best fuel economy may be attained on Sundays. Tables 2; references 3.

Nuclear Power Plant Safety and Human Factor: Discussion

[Article by V. I. Smutnev, Novovoronezh Nuclear Power
Plant]

UDC [621.311.25:621.039]:621.039.68

[Abstract] The need for comprehensively addressing the
issue of nuclear power plant (AES) safety and the human
factor which may be efficient if there is a hierarchical
system of goals and methods of attaining them is dis-
cussed. This hierarchical system is defined as containing
(in the order of diminishing priorities) the definition and
characteristics of controlled plant; definition and charac-
teristic of the controlling operator; the necessary and
sufficient interrelation conditions of the controlled plant
and controlling operator; the necessary control formula
derived from the above definitions and conditions; the
methods of attaining an interrelation of the controlled
plant and its controlling operator; and the methods of
implementing and supporting the adopted control for-
mula. References 3.

Investigation of Insulating Conductor Suspension of VL 500 kV Compact Aerial Power Lines With Increased Capacity

[Article by P. V. Gorbunov, S. V. Krylov, Leningrad
Engineering University and All-Union Scientific Research
Institute of Power Engineering]

UDC 621.315.1

[Abstract] Various conductor insulator suspension designs
of the H-frame tangent-suspension supports for 500 kV
compact power lines and their relation to the power line
capacity are examined. An analysis shows that the voltage
distribution in catenary V-shaped suspension insulator
strings in compact VL 500 kV aerial power lines with
ellipsoidal phases can be effectively equalized without
using protecting shields by positioning the insulator string
fastening points near the center of the split wire thus
attaining the wire distribution stability under the effect of
wind loads. The convenience of wiring the split conductors
in V-shaped catenary insulator strings is ensured by
installing the line accessory inserts to which temporary
mounting stay wires are fastened at lower parts of the
strings. Line accessory inserts separating the lower parts of
catenary insulator strings do not significantly affect the
voltage drop on the most stressed insulators in the string.
Figures 11; tables 2; references 10.

Noise Variability of Integral Pulse Signal Shape Patterns

[Article by S. B. Lukin, Leningrad Institute of Precision Mechanics and Optics]

UDC 621.391

[Abstract] Analysis of the shape of pulse radar echo signals reflected from targets makes it possible to classify them by the geometrical shape of their surfaces whereby the quality of such classification largely depends on the stability of the shape patterns of the echo signals to changes in the identification task conditions. The instrument channel noise is one of the essentially unavoidable factors affecting the values of these patterns. A classification of a pulse signal of a fixed shape in the presence of additive normal noncorrelated noise with a zero mean is considered and the statistical description of the pulse signal's initial moment vector components is derived. The study demonstrates the statistical isotropism of the pattern space: the type of statistical cloud is determined solely by the signal power, spectral noise power density, and observation interval; it also reveals that the instrument channels noise is independent of the pulse shape. References 5.

Systolic Rank Filtering Processors

[Article by Yu. F. Romanov, A. Yu. Tropchenko, K. M. Yusupov, Leningrad Institute of Precision Mechanics and Optics]

UDC 681.325

[Abstract] The role of the rank filtering methods among digital image processing methods, whereby the elements occupying a certain position in a series of an increasing order of window elements are sought, is discussed. The architecture of systolic processors are considered. It is shown that such sorters ensure the necessary speed with smaller hardware outlays. The algorithm of their operating principle based on the bit-by-bit search method is presented and their block diagram is cited. The systolic processor consists of a series arrangement of processor units (BYa) all of which except for the first one are connected to a storage cell (ZYa). The processor unit, in turn, consists of an arithmetic-logic device (ALU), a comparator (K), and registers. The operating principle of all systolic processor elements is described in detail. Figures 2; references 4: 3 Russian, 1 Western.

Mathematical Expectation of Fiber Optic Transducer Photocurrent in Surface Roughness Estimates

[Article by S. T. Koval, T. V. Levchenko, Kiev Polytechnic Institute]

UDC 621.81:531.717.82.082.5

[Abstract] Uses of fiber optic transducers (VOD), i.e., a combination of a light source and photodetector with a fiber optic waveguide for transmitting radiation, for proximate in-process monitoring of the roughness of machined surfaces are discussed. A statistical model of the fiber optic transducer photocurrent development process is produced by representing roughness in the form of specular facets determined by the radius vector of their center, their normal, their area, and their reflectance. If the effective facet illuminance which depends on the positions of the radiating and detecting fiber optic transducer apertures is known, the fiber optic transducer photocurrent as a function of the number of facets and integral sensitivity can be found. The mathematical expectation (MO) of the fiber optic transducer photocurrent - the most important practical case of a steady-state process - is thus found. The mathematical expectation makes it possible to evaluate the root mean square slope of the roughness relief microfacets and their height. It is speculated that the computation procedure may be improved by taking into account radiation absorption by the monitored surface. Figures 1; references 4: 2 Russian, 2 Western.

Error Analysis of Optoelectronic Transducer for Automatic Tractor Guidance Systems

[Article by G. M. Lavrov, V. V. Andrianov, Odessa]

UDC 535.8

[Abstract] Optoelectronic transducers (OED), i.e., instruments designed for measuring the tractor (MTA) deviation from base references and generating the results of such measurements in the form of electronic error signals used by automatic guidance systems (SAV) for controlling the tractor motion, are discussed. The design of an optoelectronic transducer for this purpose consisting of an optomechanical scanner, a sensor measuring the optical axis direction, an electric drive, and a counter is described. Equations which link the positions of the transducer's photodetector and the directrix line on the terrain are derived. It is shown that the principal component of the optoelectronic transducer measurement error is related to measurements of the field of view center deviation and does not depend on the scanning axis position. Figures 2; tables 1; references 4.

Four Mirror Hinge-Based Scanning System

[Article by O. K. Kucherenko, Kiev Polytechnic Institute]

UDC 535.312

[Abstract] The use of various types of scanning systems with swinging mirrors or prisms for viewing the space of objects in a telescoping sighting system with a small field of

view angle is discussed. A scanning system on the basis of a four-mirror hinge which makes it possible to compensate for the image plane rotation without using additional compensators and ensures the rotary-rotary motion of the scanning field is proposed. The system enables the viewer to move the field of view of the telescopic sighting system within the necessary scanning field. The matrix method is used to demonstrate that the image plane does not rotate when the mirror hinge is turned relative to the sighting system objective lens axis and the image position does not change. The scanning field dimensions are determined by the angular position of the head mirror and rotation angles of the mirror hinge relative to the sighting system lens axis. An increase in the scanning field does not lead to an increase in the mirror dimensions. Figures 1; references 3.

Information

[Article by Editorial board]

[Abstract] Specifications of various hybrid film integrated circuit microassemblies manufactured by the Mikropribor production association in Lvov and offered for sale are presented. All chips are encased in cermet housings with vertical terminals and are intended for operation in a -10 to +70°C temperature range. The devices being advertised include an M2USE4571 differential amplifier, an M2USE4341 programmable noninverting amplifier, an M2UDE4551 operational amplifier, an U2US1881 instrumentation amplifier, a U2UD2001 high-speed operation hybrid amplifier, voltage regulators, series M2P digital-to-analog and analog-to-digital converters, and an M2YePE4351 current source.

Expert Systems for Electrical Equipment Diagnostics

[Article by V. M. Nadtochiy, All-Union Scientific Research Institute of Power Engineering]

UDC 621.313.12.001.6

[Abstract] The use of expert systems (ES) - software packages capable of learning and acquiring the knowledge of skilled experts in certain fields and using this knowledge for estimating complex situations and generating optimal solution recommendations - is discussed. The use of specific expert systems for power plants being designed in various countries by Westinghouse, Battelle Labs, EPRI, Honeywell, GE, JCP&L is summarized and the architecture of expert systems for turbine vibration, centralized turbogenerator diagnostics, turbine plant monitoring and diagnostics, etc. is presented. It is shown that expert systems in the West are being rapidly implemented in power engineering and that existing software and instrumentation expert system developments opens up the possibility of selecting the most expedient architectures of specific process monitoring expert system but that the

development of a consolidated "plantwide" expert system encompassing all operating characteristics of the entire power generating unit and the power plant as a whole does not appear feasible. Functional capabilities of local expert system developed for the specific process tasks must make these systems easily adaptable to other tasks and compatible with local expert systems having a different architecture which may eventually make it possible to develop a consolidated expert system for power plant diagnostics. Figures 10; tables 1; references 14: 2 Russian; 12 Western.

Double Electric Layer-Based Molecular Electric Energy Integrators

[Article by A. M. Ivanov, A. F. Gerasimov]

UDC 537.224

[Abstract] The development and operating principle of various types of capacitive integrators for storing electric energy are summarized and the results of a comparative analysis of the characteristics of various types of contacts containing electronic and ionic conductors suitable for developing electric energy storage devices are presented. The energy density in the barrier layer, energy storage duration, discharge time, double layer capacitor applications, and design features of metal-semiconductor, metal-heavily doped semiconductor, metal-compensated semiconductor, and metal-inert electrolyte contacts are compared. In developing barrier electric field-based electric energy storing devices formed on the surface of a contact of two materials with different electric parameter, the use of metal-liquid electrolyte type contacts is preferable; in this case the energy density of the double electric layer reaches 10^2 J/cm^3 while the stored energy may be kept up to 10^5-10^6 s in systems with chemically inert electrolytes. The limit of energy density in the storage element containing two highly porous electrodes with a specific surface of up to 10^3 m^2/cm^3 reaches 50 J/cm^3. Tables 1; references 14: 8 Russian, 6 Western.

On Problems of Assessing Electrical Installation Safety

[Article by A. P. Kovalev]

UDC 621.31-784.37

[Abstract] The issue of ensuring and analyzing electrical installation safety is considered in the framework of power engineering system reliability. An installation is defined as a production facility with an explosion or fire hazard due to electrical sources. Using Markovian random processes, a method of assessing the explosion and fire safety of an engineering installation is selected from among several possible methods. The mean time during which the element is in safe and hazardous states is used as the initial data. For this purpose, hazardous state is defined as one in which a randomly damaged installation is capable of

releasing an electric source whose duration and power are sufficient to ignite the ambient hazardous medium. A mathematical model is proposed for determining the principal engineering installation safety characteristics for any ratio of hazardous and safe states. The model makes it possible to analyze the effect of unmanned elements on the explosion and/or fire safety of engineering installations. Figures 2; references 11.

Impulse Dielectric Strength of Suspension Insulators for Highest Voltage Class Transmission Lines

927K0075D Moscow ELEKTRICHESTVO in Russian No 8, Aug 91 pp 60-62

[Article by G. N. Aleksandrov, Yu. A. Gerasimov, Leningrad State Engineering University]

UDC 621.315.624.4.015.52.001.6

[Abstract] Studies of cap and pin string insulator units under the effect of lightning strokes are summarized and the results of an investigation of the impulse dielectric strength of the suspension insulator for the outer phase are presented. Discharge voltage on the PSK-210A, PS-300K, PS-400A, and LK-300/500 string insulator units with the positive and negative discharge polarity is examined in various phase configurations. An analysis of the results shows that shielding of the wire and string joint makes it possible to increase the impulse strength of disk insulator strings considerably for the negative pulse polarity. The most efficient shielding method is burying one or two string insulators inside the split wire. The greatest impulse strength of close to 550 kV/m was recorded in a polymer suspension insulator. Figures 3; tables 1; references 4.

Dielectric Strength of Polymer Truss-Type Post Insulator Structures Under Overvoltage Impulses

927K0072A Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 91 pp 9-13

[Article by A. I. Afanasyev, Leningrad State Engineering University]

UDC 621.315.623.001.5

[Abstract] The use of polymer materials for developing post insulator structures (IK) for outdoor installations makes it possible considerably to improve their performance. Such polymer insulator structures for isolators and bus supports are especially effective when designed as trusses. To increase the truss insulator stiffness, it is girdled with chords shaped as regular polygons. The effect of the stiffening chords on the dielectric strength of truss-type polymer insulator support structures under lightning and switching overvoltage impulses was examined in 1985-1988 in an outdoor super-high voltage test bench at the Leningrad State Engineering University. A 7.0 MV, 560 kJ outdoor impulse generator was used to simulate lightning stroke and switching voltage surges. Test voltage pulses had a pulse rise to pulse duration ratio of 1.32/52 μs for lightning stroke and 300/2,520 μs for switching overvoltages. Both lightning stroke and switching voltage impulse polarities were examined. The experimental

results are found to be consistent with theoretical calculations. Measures are recommended for increasing the dielectric strength of truss insulators; if implemented, they will make it possible to ensure the discharge characteristics of real polymer truss post insulator supports at the level of the air gap between the high-voltage shield and pedestal shield. Figures 4; tables 4; references 13: 10 Russian; 3 Western.

Investigation of Electric Aging of Mica Crystals in Uniform Electric Field

927K0072B Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 91 pp 20-25

[Article by M. S. Metsik, V. B. Berezhanskiy, V. V. Gorodov, G. Yu. Gladkiy]

UDC 621.315.611.002.25

[Abstract] Electric aging of mica crystals is investigated. To this end, the dependence of mica's service life on the electric field strength in both static fields and alternating fields at a commercial frequency is examined. The experimental procedure ensured that the corona discharge is quenched. Round electrodes with a 15 mm diameter were applied to 50x50 mm mica crystals with a 20-40 μm thickness. The samples were tested between two brass electrodes at elevated temperatures in a thermostat and at low temperatures in a special styrofoam chamber through which liquid nitrogen vapors were pumped. The cooling rate was controlled by the liquid nitrogen evaporation rate form a Dewar flask. Phlogopite and muskovite samples were tested in static and alternating fields in order to establish the dependence of their service life on the electric field strength and the results are compared to those obtained in a 50 μm thick polyethylene terephthalate (PETF) polymer film at a room temperature. An analysis of the data shows that in static fields, there are not differences in the dependence of service life on field strength within a 10-10^5 s range; in an alternating field at a strength below 150 kV/mm for phlogopite and 200 kV/mm for muskovite, mica forms a stable slowly aging filler in the polymer epoxy insulator matrix. Figures 7; tables 2; references 14: 13 Russian, 1 Western.

Amplitude-to-Digital Converter

927K0070A Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 91 pp 101-103

[Article by A. S. Glyanenko, A. I. Grigoryev, Moscow Engineering Physics Institute]

UDC 681.335

[Abstract] An amplitude-to-digital converter (ATsP) necessary for smoothing the statistical characteristics of spectrum analyzer channels in spectral radiation measurements of astrophysical entities with "drooping" spectra is described. The use of such devices is dictated by the need to save the space on board spacecraft. The eight-bit amplitude-to-digital converter is executed as a single electronic module which makes it possible to multiplex analyzer channels from 512 primary channels to any number of channels by an arbitrary law while four different data

processing algorithms are used in the maximum amplitude-to-digital converter configuration; the amplitude-to-digital converter operates with inorganic scintillator crystal-based scintillation detectors at a pulse rise time of at least 100 ns on the amplitude-to-digital converter input. The conversion time is 100 μs and the power demand is ≤1.4 W. A block diagram of the converter and a timing chart illustrating the amplitude-to-digital converter control module operation are presented. The module is executed on a 160x180 mm² printed board and has an integral nonlinearity of <0.1 percent and a differential nonlinearity of <0.5 percent. It has a <0.01 percent/°C temperature instability within a 10-50°C range. Figures 2; references 3.

Wide-Band Sampling and Storage Device for Analyzing Rapid Processes

[Article by V. V. Shkarupin, V. Ye. Donets, N. I. Teterina, Kiev Polytechnic Institute]

UDC 681.327.67

[Abstract] A sampling and storage device (UVKh) necessary for increasing the accuracy of the digital-to-analog converter (ATSP) used for converting the instantaneous values of high-speed processes during their computer analysis is discussed. The principle of signal sampling by the drop front and the use of sampling and storage elements in the forward circuit of a wide-band amplifier make it possible to design a wide-band sampling and storage device operating at frequencies of up to tens of megahertz. The active sampling and storage device with a unit gain has a sampling time of <1 ns and a storage duration of 10 μs with an error of less than 0.05 percent. The sampling and storage device has a frequency response flat within 1 percent at frequencies under 10 MHz and flat within 2 percent at frequencies up to 50 MHz. The maximum output voltage level is 3 V at frequencies below 15 MHz, and 1 V at 30 MHz. The sampling and storage device's circuit diagram and the dependence of the instantaneous voltage on the FET gate turn-on time are cited. Figures 2; references 2.

Superwide-Band Line Power Amplifiers

[Article by D. D. Alekseyevskiy, V. M. Makogon, S. V. Melikhov, A. A. Titov, V. V. Feklin, Scientific Research Institute of Automatic Devices, Novosibirsk]

UDC 681.375.421.026

[Abstract] Special requirements for superwide-band amplifiers operating at ambient temperature fluctuations of -60 to +60°C are discussed. The circuit diagrams and configuration layouts of superwide-band line amplifiers for such temperatures executed on both field-effect and bipolar and on bipolar transistors only are cited and the tuning characteristics of these amplifiers are described. The line amplifiers have a gain of ≥32 dB, and amplitude frequency response flat within ≤3 dB, a working frequency band of 70-1,050 MHz, a rated output power level of ≥1.5 W at a voltage standing wave ratio (KSVN) of ≤1.5, and an operating temperature range of -60 to +60°C. The amplifier is characterized by a good recurrence rate of its characteristics, so when duplicated, its requires virtually no tuning. The pulse leading edge spread during amplification is ≤5 percent. The amplifier retains serviceability following a load short circuit or disconnection. Figures 3; references 8.

Wide-Band Power Power Amplifier for Acoustooptic Systems

[Article by A. N. Dyachko, S. V. Melikhov, A. A. Titov, Tomsk Control System Automation and Radio Electronics Institute]

UDC 681.375.026

[Abstract] A method of increasing the output power of wide-band power amplifiers used in radioengineering systems for various purposes, particularly laser radiation modulation systems, with the help of long-line adding circuits is discussed and the design of a wide-band power amplifier in which an adder with decoupled inputs is used, making it possible to tune individual channel amplifiers separately and eliminated their mutual effect on the shaping of the resulting amplitude-frequency characteristic, is presented. As a result, the amplifier's power output exceeds that produced by an individual transistor. The amplifier has a 150 kHz to 230 MHz working frequency band, a 45 dB gain, a 25 W power output, and a 250 W power demand. Its amplitude frequency response is flat within +/-2 dB, it has an input voltage standing wave ratio (KSVN) of ≤2, and an oscillator and load impedance of 20 Ω. Figures 1; tables 1; references 5.

Two-Channel High-Voltage Nanosecond Pulse Generator

[Article by Yu. A. Mansurov, M. A. Greshnov]

UDC 621.373

[Abstract] The use of the shock wave method to generate nanosecond-long high-voltage pulses on a low-impedance load and the difficulties of making the low-impedance line are discussed; a high-power pulse generator in which two units of four hydrogen thyratrons operating in parallel generate two 12 V output pulses on four 5 Ω loads with a 100 pF capacitance are described. Thyratron-generated pulses of about 120 ns width and a rise time of about 40 ns are compressed and corrected by nonlinear saturable coil reactors. The pulse repetition frequency may reach 2 kHz. The generator is assembled inside a standard modular

rack; it is connected to the loads by eight 12-m-long KVI-120 cables with a total characteristic impedance of 2.5 Ω each. The leading edge spread on the loads in each channel is <20 ns and the generator efficiency is at least 67 percent. The authors are grateful to V.M. Gavuchev for helping to assemble and tune the generator. Figures 3; tables 1; references 5.

High-Voltage Pulse Generator for Image Intensifier's Microchannel Plate Power Supply

[Article by N. P. Polyakov, V. A. Chikurov, Atmospheric Optics Institute at the Siberian Branch of the USSR Academy of Sciences, Tomsk]

UDC 621.373.5

[Abstract] The difficulty of forming quasisquare pulses on microchannel plates (MKP) which serve as high-speed optical gates used in recording systems of extremely weak scattered laser pulses due to the capacitive characteristics of such plates is discussed. A prototype of a microchannel plate power supply system which makes it possible generate pulses with a rise and decay time of 50 ns, a 200 ns duration, and a controllable amplitude within 500-1,000 V is described. The prototype had two shortcomings: the difficulty of controlling the bias current and changes in the pulse decay when the pulse amplitude was being adjusted. The final pulse shaper version in which said shortcomings have been resolved is presented and its operating principle is described. The shaper has a pulse repetition frequency of up to 10 kHz and is executed on a 100x150 mm^2 printed circuit with one-sided wiring. It is placed in direct proximity to the microchannel plate so as to avoid using long connecting cables which lead to a substantial pulse shape distortion. Figures 1; references 3: 2 Russian, 1 Western.

Backward Wave Tube-Based Submillimeter Band Relaxometer-Spectrometer With Picosecond Time Resolution

[Article by E. Ye. Aksayev, Ye. M. Gershenzon, G. N. Goltsman, G. I. Mirskiy, A. D. Semenov, Moscow State Teachers Institute]

UDC 621.313.535.215

[Abstract] The issue of investigating rapid processes occurring in semiconductors, metals, and superconductors by measuring the relaxation time which is one of their most representative parameters and determines the limit of solid state electronic device's characteristics is addressed. A backward wave tube-based automatic high-sensitivity relaxometer-spectrometer operating in a 4-0.25 mm band which makes it possible to study the response kinetics of a sample with a 10 ps time resolution is described. Relaxation measurements are taken using beats of two identical tubes, one with a fixed and the other - with a tunable frequency. The amplitude-frequency curve of the response is recorded in the synchronous detection operation in a 10^7 to 10^{10} Hz band. The second intermediate frequency produced by translating the tubes' frequencies to the low-frequency band is stabilized using a PLL circuit. The device's high sensitivity attained by narrowing the recording bandwidth to 100 Hz within the entire measurement band made it possible confidently to record the $U(f)$ dependence at a radiation flux density of ≤0.1 W/cm^2. The device is controlled by a microcomputer. The experiment is supported by the scientific council on the issues of high-T_c superconductivity and is carried out in the framework of project No. 40 of the "High-T_c Superconductivity" state program. Figures 6; references 5: 4 Russian, 1 Western.

High-Voltage Precision Secondary Power Supply Source

[Article by S. V. Savinov, A. V. Stepanov, I. V. Yaminskiy, Moscow State University]

UDC 621.314.58

[Abstract] The issue of attaining the reference voltage source stability and a high loop gain in precision voltage regulators and the resulting problem of ensuring the circuit stability are addressed. The design of a regulator which attains the above parameters is presented and its operating principle is described. The voltage regulator's high reference source stability of 10 μV/°C is ensured by using a KS191F stabilizer diode and a 140UD14 operational amplifier. A KT859A transistor with a 500-1,200 V output at a 50 mA current level, a <0.1 mV fluctuation level, and a 2 mV/h drift is used in the regulator. Except for the rectifier, all electrical parts are assembles on a 115x125 mm^2 board with a metal shield. The power supply reaches the operating condition in 5 min. Figures 1; references 1.

Multichannel Time Analyzer for Time-of-Flight Mass Spectrometer With Californium-252-Based Ion Source

[Article by I. M. Islamov, Moscow]

UDC 53.08

[Abstract] A block diagram of a time-of-flight mass spectrometer (VPMS) with a ^{252}Cf-based ion source consisting of a time-of-flight mass analyzer (VPMA), a multichannel time analyzer (MVA), and a microcomputer (EVM) and its specific components are presented and the devices' operating principle is described. Five versions of the multichannel time analyzer hardware and software implementation are analyzed allowing for the random Poisson's signal stream distribution during the ion source decay and their advantages and shortcomings are shown. Data processing algorithms which are optimal by the minimum

relative error criterion are cited. The event-mixing phenomenon which distorts mass spectra and is due to Poisson's signal distribution is discussed and its relation to the time spectrum length is demonstrated. The MVA's are equipped with a signal amplitude analyzer device in order to identify heavy ^{252}Cf decay fragments which desorb the sample's particles and thus ionize them. The authors are grateful to Ye.G. Zverev and A.I. Dryannov for useful discussions. Figures 2; references 4: 2 Russian, 2 Western.

Pattern Recognition Based on Syntactic Description of its Contour

927K0056B Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 19-26

[Article by O. I. Potaturkin, G. A. Sternik, Novosibirsk]

UDC 681.3.019:681.327.12.001.362:519.688

[Abstract] Algorithms for recognizing patterns are developed on the basis of the syntactic description of their contours whereby the analogy function is generated without correlation analysis and the procedure has a higher discrimination characteristic; the algorithms are also invariant to the patterns' affinity. Compared to correlation analysis, this approach is also stable to local pattern contour distortions due to the input noise. A method which is invariant to the pattern scaling and partially invariant to the pattern orientation is proposed. Experimental results of simulating the recognition process of patterns against the background of noise are cited. A unidimensional representation whereby the distance between the points along the pattern contour is used as the independent variable is employed; in so doing, the angle between a randomly selected axis and the contour direction is determined at each contour point. The representation of data on standard patterns is compact while the method is relatively fast. Its shortcomings include the need to select the threshold in discriminating the pattern against the background and the fact that the resulting contour is not traced in all cases. Figures 10; references 6.

Peripheral Processor for Image Signal Processing

927K0056C Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 26-31

[Article by A. V. Berezovskiy, V. A. Kozlachkov, I. I. Korshever, S. A. Pavlov, K. V. Teslenko, M. Yu. Shadrin, Novosibirsk]

UDC 681.324

[Abstract] The SP-12 - a peripheral processor for digital processing of signals and images which is a modification of an earlier SP-8 processor aimed at functioning as part of a standard Q-bus-based system supported by its own operating systems with the help of special interface modules - is described and the six steps involved in upgrading the SP-8 processor are outlined. A functional description of the SP-12 processor and its block diagram are cited and its system and application software are described. The peripheral integer processor interaction with the control computer is considered and the example of multiplying two

vectors is used to illustrate in detail the sequence of procedures involved in the integer processor operation. The test software and debugger used for checking the serviceability of all processor units as well as accessing all processor registers are described. Figures 2; references 8.

Display Processor

927K0056D Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 32-37

[Article by V. I. Kablukov, V. A. Kozlachkov, I. I. Korshever, S. A. Pavlov, K. V. Teslenko, M. Yu. Shadrin, Novosibirsk]

UDC 629.77.058.74:681.3.06

[Abstract] A display processor (DP) - a specialized peripheral processor with its own set of instructions which is optimized for the job of interactive computer graphics and has special data formats and its own firmware control - and its principal characteristics, such as vector input data representation, a broad color graphic pallet, the possibility of performing various functions with input images, a high block transfer speed, a large virtual field, and flexible interaction with the control computer (EVM) are outlined. The display processor operation and architecture and its interaction with the control computer (UEVM) with the help of four addressable Q-bus registers are described in detail. The display file loaded into the display processor's vector memory is analyzed and the display processor software consisting of supervisory and test programs and firmware is described. The mathematical library contains more than 80 procedures. Figures 1; references 6: 5 Russian, 1 Western.

Investigation of Multichannel Acoustooptic Devices With Time Integration for Processing Antenna Array Signals

927K0056E Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 38-41

[Article by M. G. Vysotskiy, V. P. Kaasik, S. A. Rogov, Leningrad]

UDC 621.391:535.241.13:534

[Abstract] The shortcomings of space-integrating acoustooptic systems (AO) for processing antenna array (AR) signals, i.e., insufficient frequency resolution limited by the signal propagation time in AO modulators' acoustic lines, is identified and the results of theoretical and experimental studies of multichannel time-integrating systems intended for processing signals of linear and ring arrays are presented. To this end, the design of a coherent time-integrating correlator in which one of the single-channel AO modulators (AOM) is substituted with a multichannel AO modulator is considered. While processing linear and ring array signals, the coherent time-integrating correlator generates a light field distribution which makes it possible to find the angular coordinates of signal sources as well as perform spectral and correlation analyses. An experiment employing a prototype with a linear array signal simulator confirms the results of the theoretical analysis. The new device is especially useful in the cases where a high

frequency resolution is necessary and in operations with very long signals. The authors are grateful to G.Ye. Pappe for discussing the results. Figures 4; references 5.

Using Multichannel Waveguide Light Modulators to Shape Linear Acoustic Antenna Beam

[Article by Yu. A. Bykovskiy, V. G. Zheregi, Yu. N. Kulchin, Yu. D. Poryadin, V. L. Smirnov, L. G. Statsenko, N. N. Fomichev, Moscow]

UDC 621.373.826:621.396

[Abstract] The use of optical processing methods in analyzing radiation patterns and space-frequency characteristics of antennas as well as estimating and analyzing radar and sonar conditions is addressed and the advantages of optical processors in accomplishing these tasks, i.e., the ease and simplicity of executing various integral operations, are summarized. The possibility of using multichannel phased waveguide modulators as space-time waveguide light modulators (VPVMS), especially for processing signals of receiving linear phased antenna arrays (FAR) as well as for monitoring and controlling in real time the radiation patterns of transmitting phased arrays which may vary in the course of operation due to possible feed phase and amplitude errors of antenna converters caused by changes in control device characteristics and interaction among its elements is considered. To this end, the possibility of using space-time waveguide light modulators for shaping linear acoustic phased array beam is investigated. A block diagram of the optical processor used for this purpose and the 26-channel phased space-time waveguide light modulator is cited and the principles of shaping the beam and controlling the phased array signals with the help of the waveguide modulator are examined. Experimental data on a five-element linear sonar antenna are presented. The correlation processing method makes it possible to control the feed phase and amplitude of the antenna converter separately. The potential of using VPVMS's for processing wide-band signals opens up the possibility of using the above methods for microwave (SVCh) antennas. Figures 4; references 11.

Problem-Oriented Electromagnetic Field Simulating System

[Article by L. A. Golubeva, Ye. A. Rapostevich, A. L. Urvantsev, Novosibirsk]

UDC 519.65:519.95

[Abstract] The issues of the design and use of the application-oriented RAMZES-2 system intended for solving electrostatic and magnetostatic problems as one class in the totality of electrophysics problems are addressed. These problem-oriented systems are aimed at persons without a programming background and therefore contain knowledge about the specific applications. Mathematical models of the magnetostatic field analysis and their principle algorithms are considered and the architecture of the RAMZES-2 application-oriented system is analyzed. The system employs the Aida command language. Examples of RAMZES-2 system applications are cited using the example of formulating and analyzing a grid of the finite elements method (MKE) and magnetic field characteristics in systems with permanent magnets as well as formulating and analyzing the flux lines of the moving coil speaker's magnetic field using a model for computing composite axisymmetric systems. Figures 5; references 11; 7 Russian; 4 Western.

Detection of Small Targets in Images Using Human Eyesight Model

[Article by I. V. Trokhimets, Kharkov]

UDC 627.397.2

[Abstract] The problem of detecting targets against the background of images which, in turn, are mixed with noise is addressed; in so doing, it is assumed that targets are small and that the targets are being detected by a model of human eyesight (ZS). This makes it possible to check whether the human sight model for may be used for detecting targets against the background of noisy images. In considering the detected signal model, it is also assumed that in a general case, the interaction of the unknown target and the image cannot be described deterministically and that the additive model is not suitable. The analysis made it possible to draw the conclusion that in order to increase the probability of correctly detecting targets in images in the presence of the channel noise, it is necessary first to process the signal by "whitening" the image which serves as the background. The channel noise degrades both the legitimate information (targets on images) and the images themselves. i.e., decorrelates them. It is thus demonstrated that the human eyesight model is suitable for detecting small targets against the background of noisy images and can be used for evaluating the quality of videoinformation transmission by the criterion of correct detection of targets in images. Figures 2; references 6.

Wide-Band Meter With Expanded Dynamic Range

[Article by Yu. A. Popov, E. A. Fomin, Ye. A. Sheverduk, Novosibirsk]

UDC 681.325.5.01

[Abstract] The need to ensure a wide dynamic range in studying wide-band signals when it is necessary to measure small signal variations at the level of high constant signals, e.g., studying the fine structure of emitter-coupled logic (ESL) and tansistor-to-transistor logic (TTL) signals, is addressed. A method of solving this problem by using a differential amplifier whereby the signal under study is applied to one of its inputs and the controlled direct bias

voltage is applied to the other is considered. The specific features of realizing such a meter for signals in a frequency band of up to 400 MHz are described. The meter uses the compensation method and is noise immune due to galvanic decoupling. A block diagram of the device is cited. Special pulse two-stage transformers with spatially isolated transmission coil turns serve as galvanic decoupling and decrease the transfer capacitance of the channel to 0.1 pF. Data transmission is controlled by ROM-resident microinstructions using an IBM PC/XT microcomputer. Several wide-band meter prototypes are in pilot operation. Figures 3; references 3.

Image Detection Using Human Eyesight Model

927K0056J Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 78-80

[Article by I. V. Trokhimets, Kharkov]

UDC 621.397.2

[Abstract] An attempt is made to use the human eyesight (ZS) model in solving the problem of image detection. To this end, a model which reflects the process of image processing by man's eyesight and makes it possible to answer the question of what attracts man's attention in an image before he proceeds to analyze it in detail is used. Images were detected against the background of additive quasiwhite noise with a Gaussian distribution law and a zero mathematical expectation and σ^2 variance. Under these conditions, man is capable of detecting images with approximately the same probability as an optimal device, thus making it possible to check the validity of the model by comparing the final results to the results of full-scale experiments. A block diagram of the eyesight model is cited and the operation of its individual units is described. The experiment was performed by the method of statistical computer (EVM) simulation using a monochromatic aerial photograph with 128x128 scanning element dimensions entered into the computer memory at 64 quantization levels while the noise was simulated by special computer routines. Experimental data show that the human eyesight model can be used for image detection and confirm the validity of the model of primary eyesight functions. Figures 2; references 5.

Analysis of Acoustooptic Translation Transducer Operation

927K0056K Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 85-87

[Article by V. I. Yurlov, Novosibirsk]

UDC 621.376.52

[Abstract] An acoustooptic translation transducer (AOPLS) intended for determining the displacements and positions of control points of entities in relation to the light beam and may be used in high-precision computer-aided systems operating in real time for various types of measurements in precision mechanical engineering, machine-building, aircraft industry, shipbuilding, antenna engineering, geodesy, as well as instruments for experimental physics, nuclear engineering, and other fields, especially for measuring the deviation from rectilinearity and planeness and controlling deformations and position of objects is described. The acoustooptic translation transducer's operating principle is based on acoustic probing of the reference light beam (OSP) and determining its coordinates by the methods of passive ultrasonic detection and ranging inside an acoustooptic light modulator (AOM). A block diagram of the acoustooptic translation transducer is cited. A theoretical analysis of the processes occurring in the AOPLS made it possible to find the mathematical description of the algorithm for determining the OSP center's position; the resulting expressions reflect the AOPLS operation as an analog processor which performs the weighting processing and produces an estimate close to the first initial moment. Figures 1; references 5.

Robovision TV System for Controlling Shape of Semiconductor Products

927K0056L Novosibirsk AVTOMETRIYA in Russian No 2, Mar-Apr 91 pp 94-98

[Article by O. S. Borovik, G. I. Nerush, P. I. Nechunayev, V. I. Syryamkin, V. S. Titov, A. A. Fomin, Tomsk]

UDC 621.865.8.005:681.586

[Abstract] The development of robovision systems (STZ) intended for automating the control of various products in the electronics industry, e.g., semiconductor chips, wafers, etc., especially on the basis of general-purpose microcomputers, is summarized. A robovision system intended for automatically checking whether the shape and design of semiconductor products - chips and wafers - correspond to the standard, i.e., sorting the products into suitable and defective by the results of an analysis of their visible surface, is described. A block diagram of the robovision system is cited and the function of its individual elements is explained. The STZ functional cycle consists of the learning stage where data on the standard are learned and the operating stage, i.e., producing the necessary information on the controlled product. The latter consists of three phases: identifying the image frame boundaries; performing preliminary data processing; and extracting the necessary data. The STZ device is integrated with a microcomputer and occupies one complete board; the storage unit is executed with 16 565RUZ chips. The probability of correctly identifying such chip defects as spalling and scratches (1 percent or more of the chip surface) is 0.998. The STZ is simple and differs from known systems by its broader possibilities and convenience in servicing since data are displayed on a black-and-white or color monitor. Figures 4; references 6.

Infrared Radiation Diffraction on Metal Surface With Periodic Low Depth Relief

[Article by S. V. Alekseyev, V. I. Gorokhov, A. S. Popov]

UDC 535.42:546.3

[Abstract] The results of experimental examinations of the dependence of diffraction efficiency (DE) on the radiation incidence angle at characteristic polarization states within a 10^{-3}-10^{-4} range are cited and interpreted. Experimental studies were conducted in a unit containing an infrared radiation source, a light chopper, a beam splitter, an echelette, a detector and an integrating sphere, a slot, a radiation detector, a calibrated infrared (IK) radiation attenuator, planar and spherical mirrors; a device for rotating the IR radiation polarization plane, a goniometer with the sample under study, a visible light source, a double-beam oscillograph, and several instruments. The dependence of diffraction efficiency on the incidence angle is established on a 10.6 μm wavelength given an orthogonal incidence plane orientation and a spatial-periodic relief on copper samples prepared by the photolithography method with a period of 14, 17, 24, and 50 μm. The results make it possible to estimate the accuracy of approximate diffraction equation solutions; the diffraction efficiency description error does not exceed 10 percent in the $h/\lambda \leq 0.15$, $1.7 \leq q \leq 5.0$, $\theta \leq 60°$ domain. Figures 3; references 6: 5 Russian, 1 Western.

Experimental Investigation of Compressed Picosecond Parametric Light Generator Radiation Field States

[Article by R. Gadonas, G. Ionushauskas, A. Piskarskas, A. Stabinis, Vilnius State University]

UDC 535.2:621.373:535

[Abstract] Generation of two phase-conjugated light waves by parametric light generators (PGS) and the relationship of wave phase conjugation to the field compression state are discussed. The interrelationship of the integral compression condition of the multimode radiation field and the degree of phase conjugation of waves generated by a parametric light generator is considered and the results of an experimental observation of compressed states in the field of a degenerate picosecond parametric light generator are presented. Space-time twinned photon states in which the conditions of integral multimode field compression are met are observed. The degree of phase conjugation of the waves generated by the picosecond parametric light generator is examined by analyzing the second harmonic (VG) spectrum or that of the sum frequency of the signal and idler waves. A YAG:Nd passive mode-locked laser was used in the study; the second harmonic was generated in a KDP crystal. Figures 2; references 8: 6 Russian, 2 Western.

Controlling 'Compressed' Optical Signals in Space and Time by Interference

[Article by I. V. Sokolov]

UDC 535.2+535.41

[Abstract] It is shown that during the interference of light waves which are in a spatially multimode compressed state, secondary scattered light waves form at a certain phase correlation; quantum photon flux fluctuations in these waves are suppressed not only in the domain of time but also in the domain of space. The resulting possibility of producing and modulating optical signals with suppressed photon flux fluctuations in the transverse beam cross section by mixing radiations in a spatially multimode compressed state on a controlled interference device is discussed. These discoveries may be used for optical processing of images and two dimensional data files. The effects under study represents a three-dimensional space-time generalization of the phenomena accompanying the interference of nonclassical light fields which have been examined from the viewpoint of noise-immune time modulation. Figures 1; references 7: 4 Russian, 3 Western.

Activated Glass-Based Luminescent Transformers for Flash Lamp-Pumped Lasers

[Article by G. A. Skripko, S. S. Dvornikov, L. Ye. Zolotareva, I. N. Kalitukho, Interbranch Advanced Training Institute at the Belorussian Polytechnic Institute, Minsk]

UDC 535.37

[Abstract] A number of low-alkaline glasses of alumoborosilicate (ABS) and borosilicate (BS) systems doped with Cu^+, Ce^{3+}, and Eu^{2+} ions is investigated for the purpose of finding efficient solid-state luminescent transformers which perform a dual function: translate the absorbed ultraviolet (UV) radiation to the visible spectrum and protect active media from harmful ultraviolet radiation. These glass matrices are selected due to their practical feasibility and a good combination of physical and chemical properties. The results attest to the high photostability of the activator glass in the systems under study thus confirming their suitability for applications as luminescent transformers; furthermore, experimental data make it possible to select a solid-state luminescent transformer which is the most suitable for each specific active medium. The efficiency of luminescent transformers on the basis of ABS:Cu^+ glass was experimentally tested in an Al_2O_3:Ti^{3+} laser; the activator concentration was equal to 0.2 percent by mass. Preliminary results show that the proposed luminescent transformers can become promising if solid-state flash-lamp pumped lasers are improved. Figures 4; references 3.